The short term effects of maternal overnutrition during gestation and lactation on hepatic seatosis, adiposity and metabolic abnormalities in rat offspring

Gerstenberg, Marina Kjærgaard; Nielsen, Mette Olaf; Raun, Kirsten; Nilsson, Cecilia

Publication date:
2010

Document version
Publisher's PDF, also known as Version of record

THE POWER OF PROGRAMMING

International Conference on Developmental Origins of Health and Disease
Campus of the University Hospital, Munich-Großhadern

Munich, Germany
6th - 8th May, 2010

PROGRAMME and ABSTRACTS

European Academy of Nutritional Sciences
Formerly Group of European Nutritionist

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www.metabolic-programming.org/munich2010

from birth to 1 year of age. Additionally, maternal milk and mammary gland (MG) parenchyma were analysed. Dams fed HP diet during pregnancy gained less body mass (-25-56%), and showed 13% lighter litters and a reduced litter size (10 vs. 11, P<0.05). MG parenchyma was reduced by 10-12 % and milk lactose % of dams fed HP during pregnancy was lower (1.6 vs. 2.0%). Offspring body mass was reduced in the C-HP group, however, body fat accretion and locomotive activity did not differ between groups. No changes in plasma metabolites were observed. Our study demonstrates immediate negative effects of HP diet fed during pregnancy and lactation on maternal body mass, rearing performance, and lactation. However, growth of the HP offspring was only transiently affected during adolescence.

III-47 The Influence of birth weight on hepatic adiponectin receptor 2 (AdipoR2) and fatty acid synthase (FAS) in neonatal pigs EARNEST

Alison Mostyn[1], T'ng Chang Kwok[1], Kayleigh Almond[1], Jennie Litten-Brown[2], Lynne Clarke[3], Michael Symonds[1]

[1]University of Nottingham, LEICESTERSHIRE, UNITED KINGDOM; [2]University of Reading, READING, UNITED KINGDOM; [3]Imperial College, LONDON, UNITED KINGDOM

Birth weight (BW) can determine later health, including the development of metabolic syndrome. Adiponectin regulates lipid metabolism and glucose homeostasis; its receptor, AdipoR2, is abundantly expressed in the liver. FAS catalyses lipid biosynthesis and both FAS and AdipoR2 are regulated hormonally and nutritionally. This study examined whether BW influences AdipoR2 and FAS gene expression in liver of neonatal pigs. Piglets from eleven litters were ranked according to BW and three animals from each litter were assigned to small (S), normal (N) or large (L) groups. Animals were humanely euthanased on 7 (n=15) or 14 (n=18) days of age and tissue sampled. Gene expression was quantified by real-time PCR. Plasma metabolites and leptin were also analysed. On day 7, L pigs had higher gene expression of FAS than N pigs (L, 2.40.4; N 1.00.2 fold change ($p<0.05$)). On day 14, N pigs had higher gene expression of AdipoR2 than S pigs (S, 2.20.1; N 2.90.3 fold change ($p<0.05$)). AdipoR2 and FAS were positively correlated with plasma leptin on day 7 in the L group only ($P<0.05$). Despite the rate of lipid biosynthesis being low in neonatal pigs, due to the high fat content of milk, L pigs exhibited raised hepatic FAS expression, suggesting an increased capacity for lipid biosynthesis. The reduction in AdipoR2 in S piglets suggests a reduced adiponectin signalling capacity and thus an increased potential for insulin insensitivity.

III-48 The short term effects of maternal overnutrition during gestation and lactation on hepatic steatosis, adiposity and metabolic abnormalities in rat offspring

Marina Kjaergaard[1], Mette O. Nielsen[2], Kirsten Raun[1], Cecilia Nilsson[1]

[1]Novo Nordisk A/S, MÅLØV, DENMARK; [2]The Faculty OF Life Sciences - University Of Copenhagen, FREDERIKSBERG, DENMARK

Inadequate maternal diet has been linked to offspring metabolic diseases. This study was designed to develop a rat model to investigate the development of hepatic fat accumulation, adiposity and metabolic abnormalities in offspring from dams fed a diet rich in fat and carbohydrates during gestation and lactation. In this model, the combined effect of maternal overnutrition and litter size reduction on the development of metabolic traits in the offspring was further investigated. Pregnant Spraque-Dawley rats were either offered a chow diet plus chocolate or a chow diet only during gestation and lactation. At birth, offspring were randomly cross-fostered within the diet groups into small and normal litters with four and ten offspring per litter. After weaning, offspring were kept on the same diet as their mothers throughout the entire experimental period. The maternal diet high in chocolate resulted in increased birth weight, blood glucose as well as liver TG and glycogen content in offspring until 1 week of age. At 3 weeks of age increased adiposity, as well as increased plasma and liver TG were seen in high fat fed offspring. From 3 until 12 weeks of age the chocolate diet resulted in increased liver glycogen in females and plasma TG in males. Increased adiposity and liver TG concentration were also seen at 12 weeks of age in high fat fed offspring. In conclusion, a maternal gestational and postnatal diet rich in fat/carbohydrates affects the metabolic function of the offspring and could thus potentially predispose for development of metabolic diseases.

III-49

Adaption of rabbit preimplantation blastocysts to maternal type 1 diabetes

René Thieme, Maria Schindler, Nicole Ramin, Sünje Fischer, Bernd Fischer, Anne Navarrete Santos

Martin Luther University Halle-Wittenberg Faculty of Medicine, HALLE, GERMANY

We have investigated the effects of short- and long-term hyperglycaemia in 6 days old rabbit preimplantation blastocysts. The blastocysts were grown in diabetic mothers or cultured in vitro. In female rabbits type 1 diabetes was experimentally induced by alloxan treatment 10 days before mating. Short time adaption of blastocysts to different glucose concentrations (1; 10 and 25mM) was investigated by in vitro culture for 1 to 4 hours. Type 1 diabetes led to retardation in blastocyst development, an increase of apoptotic cells in the embryonic disc and a decrease in expression of the antiapoptotic gene bcl-x(L). The insulin receptor (IR) and IGF1 receptor were downregulated in both models, in vivo and in vitro, demonstrating a loss of insulin growth factor sensitivity of the embryo. The glycogenetic enzyme hexokinase was upregulated in vitro and downregulated in diabetic blastocysts while the gluconeogenetic enzyme PEPCK was decreased in in vivo and in vitro grown blastocysts. Our results document that embryonic (i) glucose metabolism and (ii) IR/IGF-signalling are strongly affected by hyperglycaemia. The dramatic loss of growth factor sensitivity results in a dysregulation of early embryonic development. Shifts in the IR/IGFR system are a potential risk factor for negative consequences in embryonic metabolic programming processes. Supported by the German Research Council (DFG; NA 418/4-2)

III-50 The impact of protein quality of early diet on later glucose homeostasis in intra uterine growth restricted (IUGR) rats EARNEST

Florence Blancher, Yasaman Shahkhalili, Julie Moulin, Mireille Moser, Katherine Mace

Nestle Research Center, LAUSANNE, SWITZERLAND

Background - IUGR, resulting in low birth weight, increases the risk of later development of metabolic diseases including diabetes. The impact of protein quality of early diet on later susceptibility to diabetes development in at risk population is not known. Aim -